SINCE 1839 Schaeffer MANUFACTURING COMPANY

ISO 9001 CERTIFIED

TECHNICAL DATA

102 Barton Street, St. Louis, Missouri 63104
In-State (314) 865-4100/Out of State 800-325-9962/Fax (314) 865-4107 http://www.schaefferoil.com

#288 HTC EXTREME PERFORMANCE WITH DYNAVIS®
ISO Grades 15, 22, 32, 46

HTC Extreme Performance with **DYNAVIS®** is a premium para-synthetic multi-grade anti-wear hydraulic fluid that is designed for year round use in the high pressure hydraulic systems of mobile equipment that require a hydraulic fluid with the viscometric properties that can operate over a wide range of ambient temperatures and in hydraulic applications that require protection against the formation of varnish deposits on close clearance servo-valves and other system components is critical. Typical applications in which the HTC Extreme Performance with **DYNAVIS®** would be used include:

- Outdoor utility vehicles operating at very low to high ambient temperatures.
- Snow plow hydraulic systems
- Hydraulic excavators and cranes.
- Surface mining and construction equipment operations at very low to high ambient temperatures that call for the use of an anti-wear industrial type hydraulic fluid.
- Off-road forestry equipment.
- Hydrostatic driven equipment that call for the use of an anti-wear industrial type hydraulic fluid
- Industrial type hydraulic systems

HTC Extreme Performance with **DYNAVIS®** is blended from the finest quality solvent refined, severely hydro-finished 100% paraffin base oils and polyalphaolefin (PAO), synthetic base fluids available. This unique combination provides HTC Extreme Performance with **DYNAVIS®** with the following advantages:

1. **Excellent Low Temperature Properties**
2. **Superior Oxidation Stability**
3. **Excellent Resistance to Thermal Degradation**
4. **High Viscosity Index**
5. **Excellent Film Strength**
6. **Superior Operating Temperature Reduction**
7. **Compatibility With All Types of Seals and Coatings**

The trend among hydraulic equipment system OEMs is to design hydraulic systems with increased power output and pressures, while minimizing the oil reservoir size in order to make the systems more compact. This trend coupled with higher oil flow rates relative to the amount of hydraulic fluid present in the system has resulted in higher operating temperatures, which increases the rate of oxidation and thermal degradation of the lubricant- all resulting in the potential for the formation of varnish and sludge deposits in the system.

Once varnish deposits are formed they can create a host of problems. Once deposited on the metal surfaces of the system, the sticky nature of these deposits can attract wear particles and contaminants to adhere to the metal surface. This sticky abrasive residue can increase overall friction, especially to servo valves resulting in reduced efficiency and responsiveness. Varnish deposits can also result in sticking servo valves which must be cleaned or replaced, restricted oil flow due to clogged or blocked filters and strainers, and poor heat transfer. All of these factors result in increased maintenance costs, system downtime and lost production.

Continued on Next Page

To combat the formation of varnish deposits, a carefully balanced, premium anti-wear additive package, **VarniShield™** is blended into these 100% pure paraffin base oils and PAO synthetic base fluids**. VarniShield™** is a patented hydraulic fluid additive technology that is designed to prevent the formation and the build-up of varnish deposits, while providing exceptional anti-wear performance, outstanding thermal and oxidation stability, rust and corrosion protection and rapid water separation. The **VarniShield™** additive system provides HTC Extreme Performance with **DYNAVIS®** with a high degree of thermal and oxidative stability thus minimizing the formation of sludge and varnish. If any varnish particles do form, the dispersancy of the **VarniShield™** additive will keep these particles suspended and prevent them from depositing on critical internal components. This helps eliminate the replacement of components such as filters and valves and the costs associated with these activities.

In addition to protecting against the formation of varnish deposits and keeping the system clean and operating longer the **VarniShield™** additive also offers the following performance benefits:

1. **Exceptional and long lasting anti-wear protection to protect system components**
2. **Extended pump life.**
3. **Extended bearing life.**
4. **Enhanced thermal and oxidative stability.**
5. **Superior hydrolytic stability.**
6. **Excellent demulsibility characteristics so water separates quickly.**
7. **Excellent rust and corrosion protection that extends component life and protects multi-metallurgy components.**
8. **Excellent anti-foaming and air release properties.**
9. **Reduced sludge, varnish and deposit formation.**
10. **Improved durability of non-ferrous parts.**
11. **Reduced filter blockage.**
12. **Excellent filterability.**
13. **Enhanced compatibility with existing fluids.**
14. **Excellent fluid quality reserve to maintain its Performance with DYNAVIS® features even under severe service conditions and extended drain intervals.**
15. **Enhanced fluid life.**
16. **Enhanced seal life.**
17. **Reduced system maintenance.**

To provide HTC Extreme Performance with **DYNAVIS®** with multi-grade properties an extremely shear stable viscosity index improver is further blended into the product. This extremely shear stable polymer viscosity index improver provides the HTC Extreme Performance with **DYNAVIS®** with a viscosity index of **>200**. This extremely high viscosity index allows the HTC Extreme Performance with **DYNAVIS®** to provide the proper viscometric properties that are needed for maximum efficiency over a wide range of operating temperatures and pressures. By maintaining its viscometric properties in the optimum viscosity range for the hydraulic pump HTC Extreme Performance with **DYNAVIS®** will provide the following performance benefits:

1. **Improved viscometric properties over a wide range of temperatures.**
2. **Less warm-up time during low temperature operation.**
3. **Faster and smoother response of the hydraulic system at low temperatures.**
4. **Improved start-up at lower temperatures**
5. **Less power required and consumed at cold start-up than conventional fluids.**
6. **Reduced risk of pump cavitation and lubricant starvation at low operating temperatures.**
7. **Improved volumetric and hydro-mechanical efficiency.**
8. **Less internal pump leakage at high operating temperatures.**
9. **Excellent resistance to recirculation resulting in a reduction in heat build-up and an increase in hydraulic system responsiveness.**
10. **Less hydraulic system fade.**
11. **Stable pump Performance with DYNAVIS®, especially during high operating temperatures**
12. **Excellent protection from wear during periods of high operating temperatures and high pressures.**

(Continued on Next Page)

13. **Higher flow rate at peak operating temperature.**
14. **Stress on the overall system is kept in check.**
15. **Significantly less wear and tear on hydraulic system components such as pumps hoses and seals.**
16. **An increased Temperature Operating Window (TOW) that allows the fluid to perform consistently and reliably with in a wide range of temperatures from cold to hot.**
17. **Ability to exhibit lower viscosity at cold temperatures and delivery of stay-in-grade viscosity at high operating temperatures.**
18. **Minimization of friction and wear and reduced fuel consumption over a wide temperature range.**
19. **Elimination of seasonal changes.**
20. **Increased hydraulic power.**
21. **Enhanced energy efficiency.**
22. **Improved productivity (more work can be done in the same amount of time).**
23. **Lower energy consumption for the same amount of work.**
24. **Reduced Greenhouse gas emissions**
25. **Lower operating temperatures.**
26. **Reduced risk of overheating and equipment shutdown.**
27. **Potential fuel savings and reduced emissions.**
28. **Reduced operating and maintenance costs.**

With the trend by hydraulic pump manufacturers to employ higher speeds, higher pressures reduced cycling times and small systems along with the fact that in many applications that the equipment may be operating beyond its design capacity this has resulted in thin film lubrication conditions taking place. These thin film lubrication conditions can result in increased wear conditions and rates taking place. These increased wear conditions and rates can not only result in a loss in system efficiency, reduced equipment life and lead to potentially catastrophic system failure.

Though HTC Extreme Performance with **DYNAVIS®** contains an exceptional anti-wear performance additive system that last longer than most conventional anti-wear hydraulic fluids the product's anti-wear capabilities is further enhanced by the addition of Micron Moly®.

Micron Moly® is a liquid soluble type of moly that plates itself to the sliding, rolling and rubbing metal surfaces of the hydraulic and compressor systems. This plating action forms a long lasting solid lubricant film on these rubbing, rolling and sliding surfaces. This moly film will withstand pressures up to 500,000 pounds per square inch. Once plated to the sliding, rolling and rubbing metal surfaces the Micron Moly® not only produces a smooth finish surface, but also reduces friction between the moving parts. This results in less heat being generated, which in turn not only reduces operating temperatures, but also downtime

HTC Extreme Performance with **DYNAVIS®** meets and exceeds the following specifications and manufacturers requirements: Denison HF-O, Eaton-Vickers M2950-S, JCMAS HK specification Eaton Char-Lynn, Haldex Barnes, Husky, FMC, Rexnord, Commercial Shearing HD 2/900, Commercial Hydraulics, Cincinnati Machine P-68 (ISO 32),and P-70 (ISO 46), DIN 51524 Part 3, ISO 6743/4 Type HV, ISO 11158:2009 HV, GB 1111-81-1-94 (HV Fluid), Bosch Rexroth, Saur Sundstrand, Saur Danfoss, US Steel 126, 127 and 136; AF Nor E 48-603, MIL-H-5606A (ISO 15 Grade only)

TYPICAL PROPERTIES

ISO Grade	**15**	**22**	**32**	**46**
AGMA Grade	---	---	----	1
Specific Gravity 60°F/15°C	0.88	0.86	0.875	0.88
Viscosity cSt 40°C (ASTM D-445)	14.6 – 16.5	20.10-23.55	29.40-34.75	43.50-50.40
Viscosity cSt 100°C (ASTM D-445)	4.00 – 4.75	4.90-5.70	6.8-7.8	9.3-10.61
Viscosity Index (ASTM D-2270)	227	201	204	207
Brookfield Viscosity (ASTM D-2983)				
cP @ 0°C/32°F		120	210	309
cP @ -10°C/14°F		230	419	---
cP @ -20°c/-4°F		479	989	2,259
cP @ -30°C/-22°C	<500	1,250	2,529	5,917
cP @ -40°C/-40°F	562			

Sonic Shear Test after 40 minutes				
(ASTM D-5621)% Viscosity Loss @ 40°C	7.5	7	7	7.9
Flash Point °F/°C (ASTM D-92)	390°/198.89°	420°/216°	435°/224°	440°/227°
Pour Point °F/°C (ASTM D-97)	<-76°/<-60°	-76°/-60°	-65°/-54°	-63°/-53°
Aniline Point °F/°C (ASTM D-611)		220°/104°	220°/104°	220°/104°
Total Acid Number (ASTM D-664)	0.91	0.91	0.91	0.91
Copper Strip Corrosion Test 3 hrs. (ASTM D-130)	1A	1A	1A	1A
Rust Test (ASTM D-665)				
Procedure A (Distilled Water)	Pass	Pass	Pass	Pass
Procedure B (Salt Water	Pass	Pass	Pass	Pass
Four Ball EP Test (ASTM D-2783)				
Weld Point, kg-f	160	160	160	160
Four Ball Wear Test (ASTM D-4172)				
(1hr/40kg/130°F				
Mean Scar diameter, mm	0.5	0.45	0.4	0.4
Four Ball Wear Test (ASTM D-4172)				
1hr/20kg/130°F)				
Mean Scar diameter, mm	0.3	0.27	0.27	0.27
Falex Continuous Load lbs.				
(ASTM D-3233)Failure Load,lbs-f	1250	1250	1250	1250
% Residue	0.01	0.01	0.01	0.01
Foam Tendency (ASTM D-892)				
Sequence I	0/0	0/0	0/0	0/0
Sequence II	0/0	0/0	0/0	0/0
Sequence III	0/0	0/0	0/0	0/0
ISO Grade	**15**	**22**	**32**	**46**
FZG Test (ASTM D-5182)				
Load Stage Pass	12	12	12	12
Hydrolytic Stability (ASTM D-2619)				
Copper Wt. Loss, mg/cm2	0.0566	0.0566	0.0566	0.0566
Acidity of Water mg/KOH	0	0	0	0
Demulsibility Test (ASTM D-1401)				
Oil-Water-Emulsion	40-40-0	40-40-0	40-40-0	40-40-0
Time, minutes	15	15	15	15
Denison Filterability Test TP-02100				
Filtration Time, without water (seconds)	146	146	146	146
Filtration Time with 2% water (seconds)	163	163	163	163
Oxidation Stability Test (ASTM D-943)				
Hours to TAN of 2	5000+	5000+	5000+	5000+
Sludge Tendencies (ASTM D-4310)				
Neutralization Number after 1000 hours	0.34	0.34	0.34	0.34
Insoluble Sludge, mg.	39.4	39.4	39.4	39.4
Total Copper, mg.	0.1	0.1	0.1	0.1
Thermal Stability Test (ASTM D-2070)				
168 hr./135°C, copper/Steel Catalyst)				
Sludge (mg/100ml)	1.8	1.8	1.8	1.8
Copper weight loss, mg/100ml	0.2	0.2	0.2	0.2
Condition of Copper Rod	1	1	1	1
Air Release (ASTM D-3427)				
Time (minutes @ 122°F	6.2	6.2	6.2	6.2
Denison T6H20C Hybrid Pump Test				
Phase 1 1700 rpm/110°C, weight loss	5.1	5.1	5.1	5.1
Phase 2 1700 rpm/80°C + 1% water,				
weight loss	5.8	5.8	5.8	5.8
Vickers 35VQ25 Pump Test				
Total Weight Loss Vane, mg	5	5	5	5
Total Weight Loss Ring, mg	11	11	11	11
Total Weight Loss, mg	16	16	16	16